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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/637,078	08/11/2000	Erik R Altman	YOR9-2000-0415US1 (8728-4	8733

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EXAMINER	
WOOD, WILLIAM H	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/637,078	Applicant(s) ALTMAN ET AL.	
	Examiner William H. Wood	Art Unit 2124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 March 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-30 and 32-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-30 and 32-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claims 1, 3-30 and 32-42 are pending and have been examined.

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05 March 2004 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The claim recites "said assisting step", which unclearly refers to the step in claim 17 or the step in claim 1.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 4-8, 11-13, 16-17, 22, 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300).

Claim 1

Krishnaswamy's background disclosed a method for profiling computer program executions in a computer processing system having a processor and a memory hierarchy *(column 1, lines 10-43)*, comprising the steps of:

- executing a computer program *(column 1, lines 33-35)*;
- storing, in a memory array, profile counts for events associated with the execution of the computer program *(column 1, lines 36-39)*
- updating the profile counts for only the events *(column 1, lines 33-37)*; and
- assisting compilation of the computer program, based upon the profile counts stored in the memory array *(column 1, lines 33-43)*.

Krishnaswamy's background did not explicitly state selected events or separate memories. However, **Krishnaswamy** later demonstrated that it was known at the time of invention to select events for profiling (column 6, lines 21-30) and separate memories (column 6, lines 28-29). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling-based optimizing compiler of **Krishnaswamy** with selecting events as found in **Krishnaswamy**'s own teaching, and furthermore it would have been obvious to implement the optimizing compiler of **Krishnaswamy** with a separate memory for monitoring performance/profiling as suggested by **Krishnawamy**'s teaching. This implementation would have been obvious

because one of ordinary skill in the art would be motivated to utilize a preferred method of profiling (column 6, line 21) that reduces code interference and provides the varying functionality provided by performance monitoring units, such as that described above.

Claim 4

Krishnaswamy disclosed the method according to claim 1, wherein said updating step is triggered by execution of the events *(column 6, lines 21-33)*.

Claim 5

Krishnaswamy did not explicitly state the method according to claim 1, wherein said updating step is triggered by execution of instructions embedded into an instruction stream of the computer program. **Krishnaswamy** demonstrated that it was known at the time of invention to instrument code for profiling (column 1, lines 56-57). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling-based optimizing compiler of **Krishnaswamy** with instrumented code as found in **Krishnaswamy**'s own teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to allow for collection of a minimum amount of data, thus saving space and time (column 1, lines 60-62), additionally not all processors are equipped with performance monitoring functions and thus instrumentation is required for profiling.

Claim 6

Krishnaswamy disclosed the method according to claim 1, further comprising the step of detecting whether a profile count has exceeded an adjustable predefined threshold *(column 6, lines 30-34)*.

Claim 7

Krishnaswamy disclosed the method according to claim 1, further comprising the step of indicating when a profile count has exceeded an adjustable predefined threshold *(column 6, lines 30-34)*.

Claim 8

Krishnaswamy disclosed the method according to claim 7, wherein said indicating step comprises the step of raising an exception *(column 6, lines 30-34)*.

Claim 11

Krishnaswamy disclosed the method according to claim 1, further comprising the step of identifying profile information corresponding to the profile counts using a profiling event identifier *(column 6, lines 26-36; column 1, lines 34-43; identification of some sort required for proper usage of collected information)*.

Claim 12

Krishnaswamy disclosed the method according to claim 11, further comprising the step of addressing the memory array, using the profiling event identifier *(column 6, lines 24-36; column 1, lines 34-43; identification of some sort required for proper usage of collected information)*.

Claim 13

Krishnaswamy disclosed the method according to claim 1, further comprising the steps of: generating the profile counts using profile counters associated with the events *(column 6, lines 24-28)*. **Krishnaswamy** did not explicitly state maintaining the profile counters in a set-associate manner. Official Notice is taken that it was known at the time of invention to store values in a set-associative manner. It would have been obvious to one of ordinary skill in the art at the time of invention to implement the memory of **Krishnaswamy** with a set associative manner. This implementation would have been obvious because one of ordinary skill in the art would be motivated to make use of a regular method of memory, which thus common and easy to use/implement.

Claim 16

Krishnaswamy disclosed the method according to claim 1, further comprising the step of supporting read operations from the memory array in an off-line optimization of the program *(column 1, lines 30-43)*.

Claim 17

Krishnaswamy disclosed the method according to claim 1, further comprising the step of assisting optimization of the program, based upon the profile counts stored in the memory array *(column 1, lines 34-37)*.

Claim 22

Krishnaswamy disclosed the method according to claim 1, wherein the memory hierarchy includes data and instruction caches, and the memory array is separate and distinct from the memory hierarchy so as to not perturb normal operations of the data and instruction caches *(Figure 2; and as above for claim 1)*.

Claim 38

Krishnaswamy disclosed the method according to claim 1, wherein said method is implemented by a program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform said method steps *(column 1, lines 34-37; compiler)*.

6. Claims 3, 9-10, 23-30, 32-34, 37 and 39 rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of "Dictionary of **Computing**".

Claim 3

Krishnaswamy did not explicitly state the method according to claim 1, wherein said storing and updating steps are performed asynchronously to prevent a decrease of an execution speed of the computer program. **Computing** demonstrated that it was known at the time of invention to perform circuit operations asynchronously (page 26, asynchronous circuit). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the system of **Krishnaswamy** with an asynchronous circuit design, including storing and updating counts as suggested by **Computing**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to allow operation with a minimum of delay (page 26, asynchronous circuit).

Claim 9

Krishnaswamy disclosed the method according to claim 1, further comprising the steps of: accumulating profile updates (**Krishnaswamy**: column 1, lines 34-37). **Krishnaswamy** did not explicitly state dividing the accumulated profile updates by a threshold fraction. **Computing** demonstrated that it was known at the time of invention to make use of scaling (page 432). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling counters of **Krishnaswamy** with scaling (or dividing/multiplying by a threshold fraction) the update value as found in **Computing**'s teaching. This implementation would have been obvious because one of

ordinary skill in the art would be motivated to adjust the stored value to the hardware/equipment (register size) limitations (**Computing**: page 432).

Claim 10

Krishnaswamy did not explicitly state disclosed the method according to claim 1, further comprising the step of scaling the profile counts to prevent profile information overflow. **Computing** demonstrated that it was known at the time of invention to make use of scaling (page 432). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling counters of **Krishnaswamy** with scaling the update value as found in **Computing**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to adjust the stored value to the hardware/equipment (register size) limitations (**Computing**: page 432).

Claim 23

The limitations of claim 23 correspond to the limitations of claims 1 and 10 and as such are rejected in the same manner.

Claims 24-30, 32-34, 37 and 39

The limitations of claims 24-30, 32-34, 37 and 39 correspond to the limitations of claims 3-9, 11-13, 22 and 17 and are dependent upon claim 23. Thus, the claims are rejected in the same manner as 3-9, 11-13, 22 and 17 in consideration of claim 23.

7. Claims 14-15 rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of **Record** et al. (USPN 5,355,484).

Claims 14 and 15

Krishnaswamy did not explicitly state the method according to claim 13, further comprising the step of selecting a profile counter to be evicted from the memory array based upon a predefined replacement, when a number of profiling events assigned to an associative class of events is exceeded. **Record** demonstrated that it was known at the time of invention to perform the above operation (column 9, lines 13-20). **Record** further demonstrated (as found in claim 15) that it was known at the time of invention to utilize the replacement strategy based upon on of least-recently-used and first-in-first-out (column 9, lines 13-20). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the optimizing profiling system of **Krishnaswamy** with the control provided by **Record**. This implementation would have been obvious because one of ordinary skill in the art would be motivated to minimize any reduction in execution time resulting from profiling a system by limiting the number of events to be monitored (**Record**: column 2, lines 17-25).

8. Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of Dictionary of **Computing**" in further view of **Record** et al. (USPN 5,355,484).

Claims 35-36

The limitations of claims 35 and 36 correspond to the limitations of claims 14 and 15 and are indirectly dependent upon claim 23. Thus, the claims are rejected in the same manner as 35 and 36 in consideration of claim 23.

9. Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of **Altman** et al., "DAISY: Dynamic Compilation for 100% Architectural Compatibility".

Claim 18

Krishnaswamy did not explicitly state the method according to claim 17, wherein said assisting step is performed during at least one of dynamic binary translation and dynamic optimization [compilation] of the computer program. **Altman** demonstrated that it was known at the time of invention to provide dynamic binary translation and dynamic optimization [compilation] (page 27, section 2 and page 28, section 2.1; additionally page 27, left column, last three paragraphs). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling compiler system of **Krishnaswamy** with dynamic translation and optimization [compilation] as found in **Altman**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to provide compiling/translating system with dynamic operation (useful for providing real-time operation; page 27, left

column, second and third paragraphs) and profiling for optimization (useful for helping code execute better).

Claim 19

Krishnaswamy and **Altman** disclosed the method according to claim 18, wherein the dynamic binary translation and dynamic optimization of the computer program results in translated and optimized code, respectively, the translated and optimized code comprising instructions groups which pass control there between *(**Krishnaswamy**: column 1, lines 30-43; and **Altman**: page 27, right column, third paragraph; page 29, section 3)*.

10. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of **Altman** et al., "DAISY: Dynamic Compilation for 100% Architectural Compatibility" in further view of **Chang** et al., "Using Profile Information to Assist Classic Code Optimizations".

Claims 20 and 21

Krishnaswamy and **Altman** did not explicitly state the method according to claim 19, further comprising the step of identifying frequently executed paths of the computer program, by instrumenting exits from the instruction groups with a profiling instruction that indicates a unique group exit identifier. **Chang** demonstrated that it was known at the time of invention to instrument groups of instructions to provide an ID (page 1305-

1306, item (a) under "Profiler implementation") and to optimize frequently executed paths (page 1306, bottom). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the optimizing profiling compiler of **Krishnaswamy** and **Altman** with group instrumentation as found in **Chang**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to optimize frequently executed program paths (page 1301, Introduction). **Chang** did not explicitly state to instrument exit points. Official Notice is taken that it was known at the time of invention to instrument exits. Furthermore, **Chang** demonstrated instrumenting the entry point (page 1305-1306, item (a) under "Profiler implementation") or taken more generally simply ensuring instrumentation of the group/function. It would have been obvious to one of ordinary skill in the art at the time of invention to instrument exits of groups/functions in the compiler of **Krishnaswamy**, **Altman** and **Chang**. This implementation would have been obvious because one of ordinary skill in the art would be motivated to provide an information about the profiled code, which includes determining if a group/function is executed. Both entry and exit points are the most obvious instrumentation points of all locations, since the are easily identifiable. Additionally, **Krishnaswamy** and **Altman** did not explicitly state the method according to claim 19, further comprising the step of extending the instruction groups along a frequently executed path. However, **Chang** demonstrated this as well on page 1306, items (b) through (e) and page 1301-1302, "Introduction".

11. Claims 40 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of **Keller** et al. (USPN 5,355,487) in further view of **Chang** et al., "Using Profile Information to Assist Classic Code Optimizations".

Claim 40

Krishnaswamy disclosed a method for profiling computer program executions in a computer processing system having a processor and a memory hierarchy, comprising the steps of:

- executing a computer program *(column 1, lines 33-35)*;
- storing, in a single memory array, a plurality of event-specific profile counts for a plurality of events associated with the execution of the computer program *(column 1, lines 36-39)*
- updating the profile counts for only the events *(column 1, lines 33-37)*

Krishnaswamy's background did not explicitly state selected events or separate memories or uniquely assigned counting. However, **Krishnaswamy** later demonstrated that it was known at the time of invention to select events for profiling (column 6, lines 21-30) and separate memories (column 6, lines 28-29) and uniquely assigned counting (column 6, lines 21-28). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling-based optimizing compiler of **Krishnaswamy** with selecting events as found in **Krishnaswamy**'s own teaching, and furthermore it would have been obvious to implement the optimizing compiler of

Krishnaswamy with a separate memory for monitoring performance/profiling as suggested by **Krishnawamy**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to utilize a preferred method of profiling (column 6, line 21) that reduces code interference and provides the varying functionality provided by performance monitoring units, such as that described above.

Krishnaswamy did not explicitly state global counter comprising a total of the counts. **Keller** demonstrated that it was known at the time of invention to track a total of counts (column 4, lines 40-51; Figure 1). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the optimizing profiling system of **Krishnaswamy** with a total counter function as found in **Keller**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to provide a user of profile information with a complete view of the system, including a total and a break down of the total (**Keller**: column 4, lines 40-65).

Krishnaswamy did not explicitly state wherein profile information associated with the profile counts describes a typical execution path of the computer program. **Chang** demonstrated that it was known at the time of invention to instrument groups of instructions to provide an ID (page 1305-1306, item (a) under "Profiler implementation") and to optimize frequently executed paths (page 1306, bottom). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the optimizing profiling compiler of **Krishnaswamy** with group instrumentation as found in

Chang's teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to optimize frequently executed program paths (page 1301, Introduction).

Claim 42

Krishnaswamy did not explicitly state the method according to claim 40, wherein the memory array is arranged as a two-way set associative array. Official Notice is taken that it was known at the time of invention to store values in a two way set-associative manner. It would have been obvious to one of ordinary skill in the art at the time of invention to implement the memory of **Krishnaswamy** with a set associative manner. This implementation would have been obvious because one of ordinary skill in the art would be motivated to make use of a regular method of memory, which thus common and easy to use/implement.

12. Claims 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Krishnaswamy** et al. (USPN 6,622,300) in view of **Keller** et al. (USPN 5,355,487) in view of **Chang** et al., "Using Profile Information to Assist Classic Code Optimizations" in further view of **Altman** et al., "DAISY: Dynamic Compilation for 100% Architectural Compatibility".

Claim 41

Krishnaswamy did not explicitly state the method according to claim 40, further comprising the step of optimizing the computer program during at least one of static and dynamic compilation using the profile information. **Altman** demonstrated that it was known at the time of invention to provide dynamic binary translation and dynamic optimization [compilation] (page 27, section 2 and page 28, section 2.1; additionally page 27, left column, last three paragraphs). It would have been obvious to one of ordinary skill in the art at the time of invention to implement the profiling compiler system of **Krishnaswamy** with dynamic translation and optimization [compilation] as found in **Altman**'s teaching. This implementation would have been obvious because one of ordinary skill in the art would be motivated to provide compiling/translating system with dynamic operation (useful for providing real-time operation; page 27, left column, second and third paragraphs) and profiling for optimization (useful for helping code execute better).

Response to Arguments

13. Applicant's arguments with respect to claims 1, 3-30 and 32-42 have been considered but are moot in view of the new ground(s) of rejection.

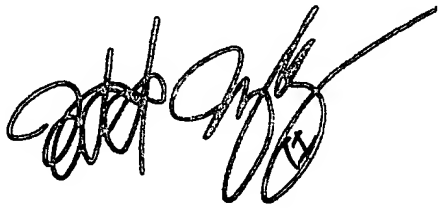
Correspondence Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William H. Wood whose telephone number is (703)305-3305. The examiner can normally be reached 7:30am - 5:00pm Monday thru Thursday and 7:30am - 4:00pm every other Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kakali Chaki can be reached on (703)305-9662. The fax phone numbers for the organization where this application or proceeding is assigned are (703)746-7239 for regular communications and (703)746-7238 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)305-3900.

William H. Wood
April 30, 2004



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